

ANALYZER SYSTEM FOR LID-COVERED SAMPLE CONTAINERS

BACKGROUND AND SUMMARY OF THE INVENTION

5 The invention relates to an analyzer system with a base housing containing a drive mechanism for a sample tray. The sample tray has at least two holding accommodations for samples that are in the process of being analyzed. The drive
10 mechanism advances the sample tray in a stepwise motion so that the samples in the holding accommodations are transported along a prescribed track to an analyzer module that is attached to the base housing of the analyzer system. The invention further relates to an at least partially
15 magnetic lid for covering a sample that is to be processed by the inventive analyzer system. An analyzer system of the kind that the invention relates to is known from the German patent application DE 100 18 876.1 which has not been published.

20 The primary focus in the aforementioned earlier patent application is on automation and efficiency improvements in an analytical process. In addition to being performed in a fast and effective way, an analysis generally has to be free of errors caused by evaporation of volatile
25 components of a test sample.

The object of the present invention is to provide a means for protecting the sample from contamination from the

outside and for preventing evaporation of the sample, e.g., in case the analyzer system is stopped temporarily. Vapors escaping from the sample are particularly undesirable if they are malodorous such as ammonia or sulfur compounds, e.g.

5 mercaptans, etc.

According to the present invention, the foregoing objective is accomplished if an analyzer system of the kind described above is equipped with a device for opening lids of a given shape and thickness that may cover the samples. The lid-opener device is arranged at a location along the sample track upstream of the analyzer module. One difficulty encountered in solving the given task was that while it is well known to cover a sample with a lid when this is deemed necessary, a lid will block the access to the sample that is to be processed by the analyzer system. The solution proposed by the present invention makes it possible to uncover the sample without thereby interfering with the automatic analysis of the sample.

Lid-handling arrangements of various configurations are known in other applications, namely in storing, transporting and handling of bulk materials. For example in GB-A-1 380 067, in the context of Fig. 4, a mechanical lid-opening and -holding arrangement is described, albeit without giving any indication of how the device cooperates with the lid. An idea of how a lid-handling device could interact mechanically with a lid to lift the latter off a sample is given in EP-A-0 847 946. Another solution, where the lid is

moved sideways, is described in FR-A 2 640 598. As an example of a non-mechanical lid-handling device, EP-A-0 547 861 proposes a suction cup for grasping a smooth lid surface. Finally, a magnetic lid-handling device has become known from DE-C-1 188 882.

All of the aforementioned known lid-opening/holding devices are intended for designs of a coarser dimensional scale. Thus, they involve relatively complex arrangements that are not adaptable for the purposes of an analyzer system. However, it should be noted that within the scope of the invention, mechanical as well as pneumatic solutions could also be used. In particular, an analyzer system according to the invention does not necessarily have to include a lid-holding device. As an example, the lid could be attached to the sample container through a hinge. As the container approaches the analyzer module, the lid is turned up, and after the analysis has been completed, the lid is turned down again by a separate lid-closing device (or it may be closed in some other way).

The concept just outlined would require two separate devices for opening and closing, respectively. It is therefore preferred if the lid-opening device is designed to also work as a lid-holding device to hold the lid during the time when the sample container is open.

As mentioned above, it is also possible under the scope of the invention to use mechanical or pneumatic devices (e.g., suction cups). However, the above-cited references